

## Form ESA-B4. Summary Report for ESA-129-3

### Public Report - Final

<b>Company</b>	John Deere	<b>ESA Dates</b>	June 24 – 26, 2008
<b>Plant</b>	Dubuque Works	<b>ESA Type</b>	Process Heating
<b>Product</b>	Construction and Forestry Machinery	<b>ESA Specialist</b>	Richard L. Bennett

### Brief Narrative Summary Report for the Energy Savings Assessment:

**Introduction:** John Deere's Dubuque Works manufactures equipment for the construction and logging industries, including backhoes and crawlers. Principal activities are heavy fabrication of components and assembly of the machines. The principal process heating devices are two natural gas-fired ovens for curing paint on the machinery components

**Objective of ESA:** Identify opportunities for energy savings on the LBH (Loader Backhoe) and CWL (Crawler) curing ovens.

**Focus of Assessment:** LBH and CWL curing ovens.

#### Approach for ESA:

1. Combine field test data with corporate energy use and production records on the LBH and CWL curing ovens.
2. Identify any equipment/operating conditions, which, if corrected or changed, can enhance energy efficiency.
3. Train plant personnel in the use of PHAST to analyze the remaining heating equipment in this plant.

#### General Observations of Potential Opportunities:

Annual natural gas consumption is 39,316 MM Btu/yr at a projected cost of \$ 8.00/ MM Btu, for \$314,528 per year. Electrical use is 74,094,000 kWh, at a cost of \$0.055 per kWh, for a total of \$4,075,170 per year. The plant also has its own steam plant, which consumes 45,492 tons of coal per year. At \$67.00 per ton, this amounts to \$3,047,964 per year.

Flue Gas Analysis of the ovens revealed 20.4% excess oxygen in the LBH oven exhaust and 20.3% in the CWL oven. (Note: PHAST data shows this as 20%, the maximum value that can be entered).

A high volume of air is drawn into the open entrances of the oven to prevent the outflow of heated air into the workspace and to maintain a balanced flow pattern in the oven and its attached paint spray booths and solvent flash-off tunnels. This air is heated to oven temperature and is then removed via exhaust fans, putting a substantial heat load on the system. Product passes through the doors for only about 30 seconds out of every three minutes; the remaining 2.5 minutes, the openings are not obstructed.

Fitting the oven with automatically-operated doors to reduce the size of the entrance openings will limit the amount of cold air drawn in when no product is entering the oven. We estimate the air inflow can be reduced to 20 – 25% of present levels. The reduced heat load is expected to reduce oven gas consumption by 26%. To maintain consistent pressures in the system, the exhaust will have to be fitted with a variable frequency fan motor or an automatic motorized damper. This will yield a small reduction in electrical consumption.

On the LBH oven, projected gas savings will be 471,000 Btu/hr, which over a year's operation will amount to 1498 MM Btu/year, worth \$11,984, plus \$225 in electricity savings. This is a medium-term opportunity.

The same retrofit can be applied to the CRL oven, which is nearly identical. Due to shorter operating hours, gas and electric savings are expected to be half as much -- \$ 5992 and \$113, respectively. Total gas savings will be 5.7% of plant wide consumption.

**Management Support and Comments:**

John Deere will investigate the cost of customized doors to analyze payback.

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